

IN THE CLAIMS:

What is claimed is:

1. (Original) A communications link failure detection system comprising:

at least two nodes, including a first node and a second node, each node having disposed therein a communications system configured to operate at least one packetized communications link, and further where each node of said at least two nodes has at least one communications link where said communications link is in operable communication with said communications system;

where said first node's communication link and said second node's communications link are in operable communication with each other; and,

where said communications system disposed within said first node further comprises a sent counter, a threshold value having an initial value, and an RTT value where said RTT value is set to a value corresponding to the time it takes a packet to make a trip from said first node to said second node and back to said first node, and where said second node sends periodic packets to said first node, and where said communications system can detect a communications link failure using said sent counter, said threshold value, and said RTT value.

2. (Original) The communications link failure detection system of claim 1 where said second node further comprises, within the communications system disposed therein, a second sent counter, a second threshold value having an initial value, and a second RTT value where said second RTT value is set to a value corresponding to the

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time it takes a packet to make a trip from said second node to said first node and back to said second node, and where said communications system can detect a communications link failure using said second sent counter, said second threshold value, and said second RTT value.

3. (Original) The communications link failure detection system of claim 2 where said first sent counter and said second sent counter are set to 0 at the start of a communications session.

4. (Original) The communications link failure detection system of claim 2 where said threshold values are a constant.

5. (Original) The communications link failure detection system of claim 2 where said threshold values are partially dependent on individual communications sessions.

6. (Original) The communications link failure detection system of claim 2 where said communications link uses an SCTP/IP-compliant protocol, and where said at least two nodes send a SACK-compliant packet from a local node to a non-local node regularly.

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7. (Original) The communications link failure detection system of claim 6 where said at least two nodes send said SACK-compliant packet from a local node to a non-local node after two data packets are received from said non-local node at said local node.

8. (Original) A method for detecting the status of a communications link between a first node and a second node, the method comprising:

- establishing an RTT value for use in said first node using said second node;
- setting a sent counter in said first node to 0 and starting an RTT-based time interval in said first node when a packet is received from said second node;
- incrementing said sent counter when a packet is sent to said second node from said first node according to said RTT-based time interval; and,
- using said sent counter to determine if a failure has occurred in said communications link between said first node and said second node.

9. (Original) The method of claim 8 wherein said communications link uses an SCTP/IP-compliant protocol.

10. (Original) A method for detecting the status of a communications link between a first node and a second node, the method comprising:

- establishing an RTT value for use in said first node using said second node;

establishing an RTT value for use in said second node using said first node;
setting a first sent counter in said first node to 0 and starting an RTT-based time interval in said first node when a packet is received from said second node;
setting a second sent counter in said second node to 0 and starting an RTT-based time interval in said second node when a packet is received from said first node;
incrementing said first sent counter when a packet is sent to said second node from said first node according to said RTT-based time interval;
incrementing said second sent counter when a packet is sent to said first node from said second node according to said RTT-based time interval; and,
using either said first sent counter or said second sent counter to determine if a failure has occurred in said communications link between said first node and said second node.

11. (Original) The method of claim 10 wherein said communications link uses an SCTP/IP-compliant protocol.

12. (Original) A method for detecting the status of a communications link between two nodes, including a local and a non-local node, the method comprising:
(a) detecting a packet event in said local node;
(b) determining if said packet event was a packet send or packet receive event;

(c) resetting a sent counter to 0 and starting a new RTT time interval if said packet event was a packet receive event on said local node;

(d) incrementing said sent counter if said packet event is a send packet event and said packet event is the first send packet event to occur within the current RTT time interval on said local node;

(e) incrementing said sent counter if said packet event is a send packet event and said packet event occurs after the expiration of the most recently started RTT time interval on said local node;

(f) comparing said sent counter with a threshold value and issuing a communications link failure message if said sent counter is larger than said threshold value on said local node; and,

(g) continuing with step (a) if no communications link failure message has been issued.

13. (Original) The method of claim 12 wherein said communications link uses an SCTP/IP-compliant protocol.

14. (Original) A program storage device readable by a machine, tangibly embodying a program of instructions executable by a machine for detecting the status of a communications link between two machines, including a local and a non-local machine, the method comprising:

- (a) detecting a packet event in said local machine;
- (b) determining if said packet event was a packet send or packet receive event;
- (c) resetting a sent counter to 0 and starting a new RTT time interval if said packet event was a packet receive event on said local machine;
- (d) incrementing said sent counter if said packet event is a send packet event and said packet event is the first send packet event to occur within the current RTT time interval on said local machine;
- (e) incrementing said sent counter if said packet event is a send packet event and said packet event occurs after the expiration of the most recently started RTT time interval on said local machine;
- (f) comparing said sent counter with a threshold value and issuing a communications link failure message if said sent counter is larger than said threshold value on said local machine; and,
- (g) continuing with step (a) if no communications link failure message has been issued.

15. (Original) The program storage device machine for detecting the status of a communications link between two machines of claim 14 wherein said communications link uses an SCTP/IP-compliant protocol.

16. (Original) In a local node having a communications link to a non-local node, a system for detecting the status of the communications link between the local node and the non-local node, the system comprising:

means for detecting a packet event in said local node;

means for determining if said packet event was a packet send or packet receive event;

means for resetting a sent counter to 0 and starting a new RTT time interval if said packet event was a packet receive event on said local node;

means for incrementing said sent counter if said packet event is a send packet event and said packet event is the first send packet event to occur within the current RTT time interval on said local node;

means for incrementing said sent counter if said packet event is a send packet event and said packet event occurs after the expiration of the most recently started RTT time interval on said local node; and,

means for comparing said sent counter with a threshold value and issuing a communications link failure message if said sent counter is larger than said threshold value on said local node.

17. (Original) The system for detecting the status of the communications link between a local node and a non-local node of claim 16, wherein said communications link uses an SCTP/IP-compliant protocol.

18. (Original) A communications link failure detection system between a first node and a second node comprising:

a communications system operably disposed within said first node, wherein said communications system in said first node further comprises an RTT determiner component operably disposed therein, and where said RTT determiner is in operable communication with said second node and configured to establish an RTT value usable in said first node using said second node;

wherein said communications system in said first node further comprises a sent counter operably disposed therein, and where said sent counter is further configured to be set to a value corresponding to an RTT time interval and a previous sent counter value when a packet is received from said second node; and,

wherein said communications system in said first node further comprises a threshold value operably disposed therein, and where said threshold value is further configured to be compared to said sent counter, enabling said communications system to make a communications link status determination thereby.

19. (Original) The communications link failure detection system of claim 18 wherein said communications system uses an SCTP/IP-compliant protocol.

20. (Original) The communications link failure detection system of claim 18 where said sent counter is set to 0 at the start of a communications session.

21. (Original) The communications link failure detection system of claim 18 where said threshold value is a constant.

22. (Original) The communications link failure detection system of claim 18 where said threshold value is partially dependent on individual communications sessions.

23. (Original) The communications link failure detection system of claim 19 where said communications system is further configured to use said SCTP/IP-compliant protocol to send a SACK-compliant packet between said first node and said second node regularly.

24. (Original) A program storage device readable by a machine, tangibly embodying a program of instructions executable by a machine for detecting the status of a communications link between a first node and a second node, the method comprising:

establishing an RTT value for use in said first node using said second node;

setting a sent counter in said first node to a base value and starting an RTT-based time interval in said first node when a packet is received from said second node; incrementing said sent counter when a packet is sent to said second node from said first node according to said RTT-based time interval; and, using said sent counter to determine if a failure has occurred in said communications link between said first node and said second node.

25. (Original) The method of claim 24 wherein said communications link uses an SCTP/IP-compliant protocol.

26. (Original) In a first node having a communications link to a second node, a system for detecting the status of a communications link between the first node and the second node comprising:

means for establishing an RTT value for use in said first node using said second node;

means for setting a sent counter in said first node to a base value and starting an RTT-based time interval in said first node when a packet is received from said second node;

means for incrementing said sent counter when a packet is sent to said second node from said first node according to said RTT-based time interval; and,

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means using said sent counter to determine if a failure has occurred in said communications link between said first node and said second node.

27. (Original) The method of claim 26 wherein said communications link uses an SCTP/IP-compliant protocol.